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Zhu et al.

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(54) **LIGHTING APPARATUS AND METHOD FOR
EMITTING LIGHT HAVING DIFFERENT
COLOR TEMPERATURES**

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(56) **References Cited**

U.S. PATENT DOCUMENTS

6,033,093 A 3/2000 Latsis et al.
7,090,370 B2* 8/2006 Clark **F21S 8/086**
362/183

(Continued)

FOREIGN PATENT DOCUMENTS

CN 201100557 Y 8/2008
CN 201496879 U 6/2010

(Continued)

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(57) **ABSTRACT**

There is provided a lighting apparatus and a method for reducing discomfort glare. The method comprises a step of providing a first portion of light radiation in a first incident angle range; and another step of providing a second portion of light radiation in a second incident angle range consecutive to the first incident angle range. The first incident angle range is greater than the second incident angle range viewed from a vertically downward direction of a light source emitting the light radiation, and the correlated color temperature of the first portion of light radiation is lower than that of the second portion of light radiation.

18 Claims, 5 Drawing Sheets

